Extension to DGIM

Task: A stream of positive integers between 1 and 2^m; estimate the sum of the last *k* integers.
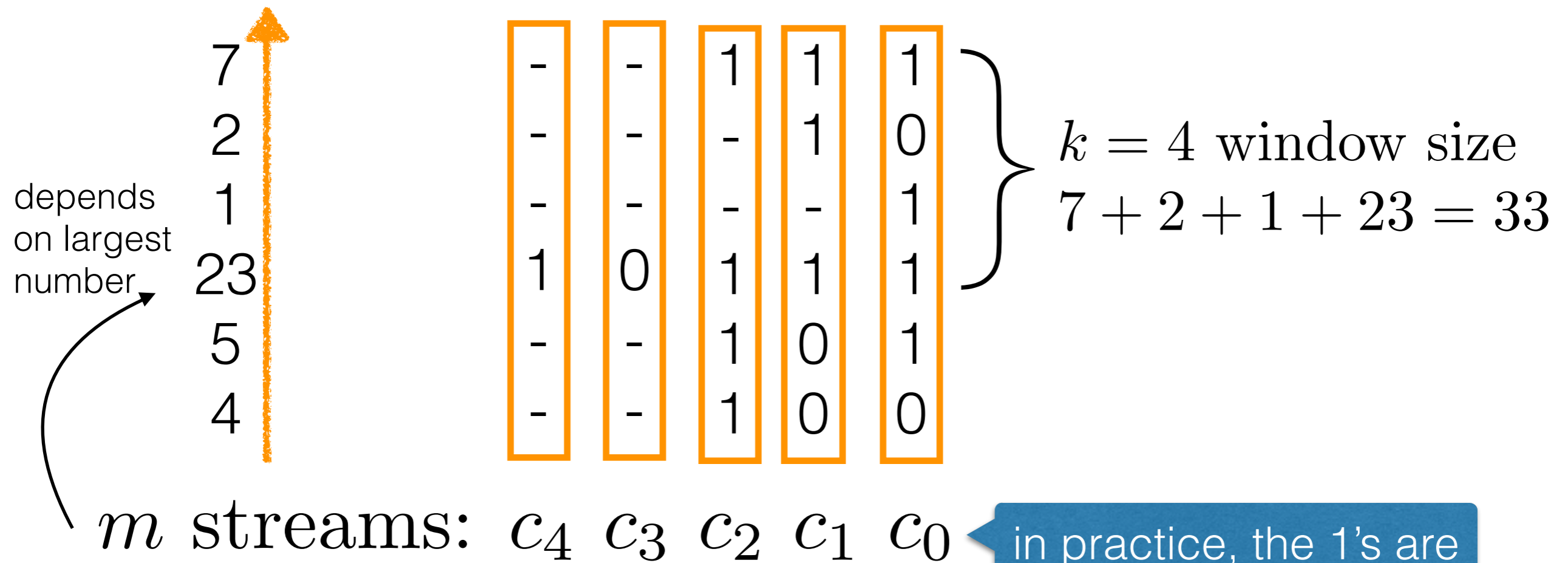
- Approach:
  - Convert integer into its binary form (m bits)
  - Each bit forms a separate stream (m streams)
  - DGIM to count the 1's in each stream
  - Let c_i be the count of the ith bit (least sign. is c_0)

$$\text{sum of integers: } \sum_{i=0}^{m-1} c_i 2^i$$

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most recent

	c_4	c_3	c_2	c_1	c_0
7	-	-	1	1	1
2	-	-	-	1	0
1	-	-	-	-	1
23	1	0	1	1	1
5	-	-	1	0	1
4	-	-	1	0	0

depends on largest number

$k = 4$ window size
$7 + 2 + 1 + 23 = 33$

m streams: c_4 c_3 c_2 c_1 c_0

in practice, the 1's are estimated via DGIM

$$3 \times 2^0 + 3 \times 2^1 + 2 \times 2^2 + 1 \times 2^4 = 33$$